

*E*valuation



*R*eport

GROUND CONTROL APPROACH-2000 RADAR SYSTEM  
TEST PLAN AND TEST RESULTS

Report No. D-2000-163

July 20, 2000

**DISTRIBUTION STATEMENT A**  
Approved for Public Release  
Distribution Unlimited

Office of the Inspector General  
Department of Defense

20000721 065

DTIC QUALITY INSPECTED 4

AQ100-10-3004

### **Additional Copies**

To obtain additional copies of this evaluation report, contact the Secondary Reports Distribution Unit of the Audit Followup and Technical Support Directorate at (703) 604-8937 (DSN 664-8937) or fax (703) 604-8932 or visit the Inspector General, DoD, Home Page at: [www.dodig.osd.mil](http://www.dodig.osd.mil).

### **Suggestions for Future Evaluations**

To suggest ideas for or to request future audits, contact the Audit Followup and Technical Support Directorate at (703) 604-8940 (DSN 664-8940) or fax (703) 604-8932. Ideas and requests can also be mailed to:

OAIG-AUD (ATTN: AFTS Evaluation Suggestions)  
Inspector General, Department of Defense  
400 Army Navy Drive (Room 801)  
Arlington, VA 22202-2885

### **Defense Hotline**

To report fraud, waste, or abuse, contact the Defense Hotline by calling (800) 424-9098; by sending an electronic message to [Hotline@dodig.osd.mil](mailto:Hotline@dodig.osd.mil); or by writing to the Defense Hotline, The Pentagon, Washington, D.C. 20301-1900. The identity of each writer and caller is fully protected.

### **Acronyms**

AFB	Air Force Base
AMC	Air Mobility Command
ASR	Airport Surveillance Radar
CLIN	Contract Line Item Number
EMI	Electromagnetic Interference
EMC	Electromagnetic Compatibility
FAT	Factory Acceptance Test
FOC	Full Operational Capability
GCA-2000	Ground Control Approach-2000
IOC	Initial Operational Capability
OUE	Operational Utility Evaluation
PAR	Precision Approach Radar

## Office of the Inspector General, DoD

Report No. D-2000-163

July 20, 2000

(Project No. 8PT-0037)

### Ground Control Approach-2000 Radar System Test Plan and Test Results

#### Executive Summary

**Introduction.** This report is a review of the test plans and test results of the Ground Control Approach-2000 (GCA-2000) radar system. On October 24, 1997, the Air Force Materiel Command, Electronic Systems Center, awarded a contract to ITT Gilfillan for three GCA-2000 radar systems. The firm-fixed-price contract with an estimated value of \$9.6 million was awarded on a sole-source basis under the authority of Federal Acquisition Regulation 6.302-2, "Unusual and Compelling Urgency." The first system was delivered 2 months late in October 1998. An operational utility evaluation followed the delivery of the first system. The evaluation revealed 85 deficiencies. The deficiencies were corrected with the exception of three reliability deficiencies, which were being worked at the time of this report.

**Objectives.** The overall objective was to analyze the completeness of the GCA-2000 radar system test plans and test results.

**Results.** The Air Force test planning for the GCA-2000 radar system was incomplete and needed improvement. As a result, the extent to which controllers could meet the multiple target requirement with the GCA-2000 radar was unknown.

Tests of the GCA-2000 radar system showed significant deficiencies in the Airport Surveillance Radar function, which caused postponement of Federal Aviation Administration certification. As a result, the October 1998 delivery justification requirement for the GCA-2000 radar system was not met. At the time of this report, the system had passed the Federal Aviation Administration flight check.

**Summary of Recommendations.** We recommend that the Program Director, Global Air Traffic Operations Mobility Command and Control System Program Office, and the Commander, Air Mobility Command, prepare test plans to demonstrate the extent to which controllers can meet the multiple target requirement with the GCA-2000 radar system as shown in the requirements documents.

We recommend, for future programs, that the Program Director, Global Air Traffic Operations Mobility Command and Control System Program Office, include a developmental effort for nondevelopmental items when system functions are not commercially available.

**Management Comments.** The Air Force agreed to establish a test plan to further demonstrate the capability for air traffic controllers to control 15 aircraft using the airport surveillance radar while simultaneously controlling 2 aircraft using the precision approach radar. Air Mobility Command's 33rd Flight Test Squadron will develop the test plan. The Air Force also stated that it had already determined the GCA-2000 Radar system is suitable for its intended purpose—first-in, expeditionary air traffic control. Further, the Air Force concurred with including a developmental effort for nondevelopmental items when system functions are not commercially available.

**Evaluation Response.** The additional tests agreed to by the Air Force meet the intent of our recommendation.

July 20, 2000

MEMORANDUM FOR ASSISTANT SECRETARY OF THE AIR FORCE  
(FINANCIAL MANAGEMENT AND COMPTROLLER)

SUBJECT: Evaluation of the Ground Control Approach-2000 Radar System Test Plan  
and Test Results (Report No. D-2000-163)

We are providing this report for your information and use. We considered management comments on a draft of this report when preparing the final report. The Air Force comments were fully responsive.

Comments on the draft of this report conformed to the requirements of DoD Directive 7650.3 and left no unresolved issues. Therefore, additional comments are not required.

We appreciate the courtesies extended to the audit staff. For additional information on this report, please contact Mr. Kenneth H. Stavenjord, at (703) 604-8952 (DSN 664-8952) (kstavenjord@dodig.osd.mil) or Mr. Chandra P. Sankhla, at (703) 604-8917 (DSN 664-8917) (csankhla@dodig.osd.mil). See Appendix B for the report distribution. The evaluation team members are listed inside the back cover.

David K. Steensma  
Deputy Assistant Inspector General  
for Auditing

# **Table of Contents**

---

<b>Executive Summary</b>	i
<b>Introduction</b>	
Background	1
Objectives	2
<b>Findings</b>	
A. Test Planning	3
B. Test Results	9
<b>Appendixes</b>	
A. Evaluation Process	
Scope	15
Methodology	15
Prior Coverage	16
B. Report Distribution	17
<b>Management Comments</b>	
Department of the Air Force Comments	19

---

## **Background**

**Statement of Objectives for the Air Mobility Command (AMC) Ground Control Approach-2000 (GCA-2000) Radar System.** On March 12, 1997, the AMC Statement of Objectives was approved to allow the Air Force to obtain four GCA-2000 radar systems in a mobile configuration that would meet the following objectives:

- suitable for use by AMC operators for control, separation, sequencing, and precision landing services in austere (lacking or with limited navigational equipment) environment;
- easily deployable (requiring a minimum of personnel for setup and minimal additional support equipment); and
- modular design to support "first-in" (single C-130 airlift and autonomous operation) and "sustainment" mission roles.
- the Air Force statement of objectives specified delivery of the first system no later than 10 months from the start of the contract and that the system would be subjected to a 2-month test defined by the AMC and Air Force.

**System Requirements Document for GCA-2000 Radar System.** The system requirements described the GCA-2000 system as an autonomous, self-contained radar system that could:

- be rapidly deployed and set up and be operational during contingency situations requiring instrument flight rules, approaches, and precision landings;
- provide services to both commercial and military aircraft at remote, temporary, austere, and unimproved airfields; and
- provide controllers with the capacity to conduct a minimum of 15 targets in the airport surveillance radar (ASR) mode, while simultaneously controlling at least 2 targets in the precision approach radar (PAR) mode.

**Air Traffic Control and Landing Systems Program Management Directive.** On June 2, 1997, the Assistant Secretary of the Air Force (Acquisition), Mission Area Director, Information Dominance issued "Program Management Directive 2062(15)/35114F/35137F (Directive 2062) for Air Traffic Control and

---

Landing Systems.” The Program Management Directive, Appendix K, discusses the GCA-2000 radar system and states that the GCA-2000 radar system was selected to meet the requirements for “first-in,” rapidly deployable, and short-term air traffic control and sustainment capability. Directive 2062 also stated that the GCA-2000 radar system would provide a near-term solution of the AMC requirement to support major regional conflicts, and contingency operation requirements in the FY 1998 through FY 2003 Defense Planning Guidance. In addition, the GCA-2000 radar system was to:

- be deployable on one C-130 aircraft,
- be set up in under 3 hours,
- provide precision approach guidance to multiple runways and to changing runways in 1 minute or less, and
- be deployable and operable with two controller personnel and one maintainer.

**Contract Award.** On October 24, 1997, the Air Force Materiel Command, Electronic Systems Center, awarded to ITT Gilfillan the contract for three GCA-2000 radar systems. The firm-fixed-price contract was awarded on a sole-source basis under the authority of Federal Acquisition Regulation 6.302-2, “Unusual and Compelling Urgency,” with an estimated value of \$9.6 million.

## Objectives

The overall objective was to analyze the completeness of the GCA-2000 radar system test plans and test results.

---

## **A. Test Planning**

The Air Force test planning was incomplete and needed improvement. This occurred because the Air Force did not include the multiple target requirement in the test plans. As a result, the extent to which controllers could meet the multiple target requirement with the GCA-2000 radar was unknown.

### **System Selection**

The multiple target requirement was a key to system selection, along with other technical requirements such as radar performance, maintainability, and transportability in a single aircraft. A May 14, 1996, MITRE Corporation, point paper compared and discussed the applicability of alternative systems and concluded that the Air Traffic Navigation, Integration, and Coordination System that was being developed for the Army, for example, provided a ground-control approach capability that was limited by the number of aircraft that two controller positions could handle. The limit on the multiple target capability meant that the Air Traffic Navigation, Integration, and Coordination System could not service the complex mission without interfacing multiple shelters, but the GCA-2000 radar met the multiple target capability requirement, provided three controller positions, and was available as a nondevelopmental item. Therefore, the significance of the multiple target requirement was apparent early in the program when alternative systems were evaluated.

### **Multiple Target Requirement**

AMC specified that it required a multiple target capability radar. The combat mission needs statement states: "Integral to AMC's requirement is a rapidly deployable airport surveillance radar/precision approach radar (ASR/PAR) system to support large-scale 24-hour operations in an austere adverse weather environment" and the system requirements document states: "The automation system must provide controllers the capability to control a minimum of 15 targets in the ASR mode while simultaneously controlling at least two targets at other positions in the PAR mode ...."

The system specifications for PAR Target Capacity and the ASR Target Capacity state,

The PAR shall be capable of extracting, tracking and displaying plots for up to 50 aircraft within the specified azimuth coverage and for up to 22 aircraft within the specified elevation coverage. . . . The ASR shall be capable of extracting, tracking and displaying plots for up to 250 aircraft within the specified azimuth coverage.

---

The November 1998 approved Operational Utility Evaluation (OUE) test plan, Section II OUE Outline, states, "COI-1 [Critical Operational Issue 1] Does GCA-2000 allow controllers to provide effective traffic control services to multiple aircraft?"

At a meeting of the test planning working group held at Eglin Air Force Base (AFB), Florida, on February 18-19, 1998, the first critical operational issue discussed was whether the GCA-2000 radar system would provide sequencing, separation, and flow control to multiple aircraft.

The system performance characteristics for the combined mode of the GCA-2000 radar system described some of the ASR function performance capabilities as follows:

- In the combined mode, the azimuth coverage of 360 degrees shall be provided by a combination of mechanical rotation of the azimuth antenna and electronic scan of the azimuth antenna. PAR azimuth tracking for up to two designated PAR azimuth targets shall be provided at the system level.
- In the combined mode, ASR blanking sectors shall not be initiated in the 30-degree azimuth region corresponding to the PAR azimuth coverage sector of 30 degrees.
- In the combined mode, ASR extracted plots in the 30-degree ASR azimuth region corresponding to the PAR azimuth coverage sector of 30 degrees shall be forwarded for display at the PAR display controller position. Detection, accuracy, resolution, and update rate of these plots shall be specified in paragraph 3.3.2.1 ASR Function Performance and subparagraphs thereto.
- In the combined mode, ASR extracted weather data in the 30-degree ASR azimuth region corresponding to the PAR azimuth coverage sector of 30 degrees shall be forwarded for display at the PAR display controller position.

## **Test Planning Working Group**

After the Air Force decided to buy a commercial off-the-shelf radar, a test planning working group was formed that included representatives from the Electronic System Command, AMC, the Project Management Office, the testing community, and the MITRE Corporation. The planning group met three times from January through April 1998 and planned tests that included loading and transporting the GCA-2000 radar system in a C-130 aircraft; environmental testing in adverse weather conditions, electromagnetic interference (EMI), and

---

electromagnetic compatibility (EMC). Those tests were to be followed by 21 days of operational testing, which was scheduled to start on August 18, 1998. But the actual testing did not start as scheduled. The Environmental tests were conducted at Eglin AFB from November 9 to December 3, 1998 and Operational tests took place at Dover AFB from January 5, 1999 to May 25, 1999.

The operational utility evaluation planning issues were revisited and discussed during the second planning group meeting held at Eglin AFB, on February 18 and 19, 1998. The planning group agreed that the GCA-2000 radar acquisition was a "Fast Track" commercial off-the-shelf acquisition and before AMC would accept the system from the contractor, the GCA-2000 radar system must pass specification testing, Federal Aviation Administration flight inspection, and be loaded and transported successfully on a C-130 aircraft. The Air Force would conduct the operational utility evaluation testing in two parts. Part 1 would be conducted in electromagnetic and environmental chambers, which simulated the operational environment with operators and maintainers exercising the system. Part 2 would be conducted at an airfield in a deployed scenario to demonstrate controlling of multiple aircraft targets and multiple aircraft variations.

The third planning group meeting was held at Dover AFB, Delaware, on April 28-29, 1998, where open action items including flight certification, member responsibilities during testing, operational utility evaluation manning requirements, and other issues were discussed.

## **Operational Utility Evaluation Test Plan and Test Schedule**

In November 1998, a test plan prepared by the AMC Air Mobility Warfare Center, 33rd Flight Test Squadron, Fort Dix, New Jersey, provided the operational utility evaluation outline based on two critical operational issues:

- Does GCA-2000 allow controllers to provide effective air traffic control services to multiple aircraft?
- Is GCA-2000 suitable for worldwide deployment?

The test plan provided details for environmental tests including methodology, procedures, evaluation methods, and survivability assessment, but it did not describe the procedures for operational testing.

An accompanying GCA-2000 test schedule dated November 6, 1998, listed 3 days of electromagnetic interference testing (November 11-13, 1998), 24 days of environmental testing (November 14 to December 7, 1998), and 13 days of flight testing (December 10-22, 1998). The test schedule also included tracking a minimum of 100 aircraft approaches and the required Federal Aviation

---

Administration certification testing. Loading and transporting the system in a C-130 aircraft and ground mobility testing were not included in the test schedule.

## Multiple Target Testing

**System Acceptance Test.** The contractor performed a system acceptance test October 5-23, 1998, witnessed by Government representatives, where the multiple target requirement was demonstrated and verified only by simulation. The test was performed using internally generated test targets inserted ahead of the plot extractor. The contractor operator verified that 50 targets were extracted, tracked, and presented in the PAR azimuth display. Similarly, the operator verified 22 targets in the elevation display. The tests did not demonstrate that the radar system could provide controllers with the capability to control a minimum of 15 targets in the ASR mode and simultaneously control at least 2 targets at other positions in the PAR mode.

**Operational Utility Evaluation.** The multiple target requirement was not included in the GCA-2000 radar operational utility evaluation testing plan. On April 22, 1999, during the system operational testing, the test manager at Dover AFB said that the multiple target requirement could not be tested because of a limited number of available aircraft. As a result, a critical performance characteristic used to justify the acquisition of the commercial off-the-shelf system was not tested. If the multiple target requirement is not demonstrated before the system is fielded, the system may have to perform a requirement that has not been demonstrated.

The project manager explained that the GCA-2000 radar system could not be used to control targets until it was certified by the Federal Aviation Administration. Therefore, the multiple target demonstration could not be performed until the end of the test program. Instead, the project manager proposed to demonstrate the ability of three Air Traffic Control personnel to monitor as many targets of opportunity as possible on the ASR display and simultaneously use the PAR displays to control two aircraft on final approach, as long as it was understood that monitoring did not involve control instructions and was restricted to watching potential traffic conflicts and providing additional services as workload permitted. However, the project manager stated that the limited ASR coverage available (up to 25 miles) would probably be too small to allow 15 targets. The project manager's statement that it was not operationally feasible to assign 15 aircraft to fly radials within the ASR range to accomplish the task brought into question the capability of the GCA-2000 radar system to meet the requirement.

---

## **Post Retrofit Test Planning**

The Air Force planned additional tests after the contractor corrected deficiencies revealed by the GCA-2000 radar system tests. The Air Force also planned a post retrofit test to ensure that the fixes were adequate. The operational testing deficiencies included the ASR never being fully functional, target dropping, target splitting, false built-in-testing indications, and numerous software and safety problems.

On June 15, 1999, the contractor submitted a test plan to correct the deficiencies and included a description of the tests to be performed, the methodology, and the criteria to verify resolution of the deficiencies. All tests were performed at the fully integrated system level, at Van Nuys, California, and at a nearby airport, to ensure that the system met the operational system specifications and that the operational utility evaluation deficiencies were corrected. On July 11, 1999, the contractor submitted a plan to validate 23 deficiency reports and to correct environmental deficiencies. The proposed verification would be conducted using manufacturer's data sheets, inspection, analysis, demonstration and test as well as test data independently acquired by ITT Gilfillan on the unit in question.

Following the contractor's tests, the Air Force was to perform Federal Aviation Administration readiness tests and flight tests to receive certification.

## **Conclusion**

The ability to control multiple targets simultaneously in the ASR and PAR modes was a critical Air Force requirement that the Air Force attempted to meet by purchasing a commercial off-the-shelf radar to fulfill. However, the Air Force operational testing program did not include demonstration of the multiple target requirement. At the time of this report, the extent to which the GCA-2000 radar met the multiple target requirement was unknown. The extent to which the system is capable of meeting the multiple target requirement needs to be demonstrated before the system is released to the user.

## **Recommendation and Management Comments, and Evaluation Response**

**A. We recommend that the Program Director, Global Air Traffic Operations Mobility Command and Control System Program Office, and the Commander, Air Mobility Command, prepare test plans to demonstrate the extent to which controllers can meet the multiple target requirement with the GCA-2000 radar system as shown in the requirements documents.**

---

**Management Comments.** The Air Force partially concurred with the recommendation to establish a test plan to further demonstrate the capability for air traffic controllers to control 15 aircraft using the ASR while simultaneously controlling 2 aircraft using the PAR. However, the Air Force stated that the system is deemed suitable for its intended purpose—"first-in", expeditionary air traffic control. The Air Force stated that rigorous simulation testing demonstrated the ability of the system to simultaneously acquire and track 15 ASR targets and 2 PAR targets. Furthermore, an operational suitability evaluation, conducted by the air traffic controllers using live traffic, confirmed the system's utility.

**Evaluation Response.** Although the Air Force partially concurred, the additional tests agreed to by the Air Force meet the intent of our recommendation.

---

## **B. Test Results**

Tests of the GCA-2000 radar system showed significant deficiencies in the ASR function, which caused postponement of the Federal Aviation Administration certification. The ASR function was not fully developed and was not identified as requiring development, unlike the secondary surveillance radar. As a result, the stringent delivery requirement of October 1998 for the GCA-2000 radar system was not met. At the time of the report, the system had passed the Federal Aviation Administration flight check.

### **Acquisition Strategy**

On September 15, 1997, in a briefing to the Air Force Program Executive Officer for Airlift and Trainers, the Program Director, Global Air Traffic Operations, Mobility Command and Control System Program Office stated that the Air Mobility Contingency Precision Approach Capability combat mission needs statement established an unusual and compelling urgency for the GCA-2000 radar system. The combat mission needs statement stated, in part, "Initial Operational Capability is required no later than 30 OCT 97 for the select core of 35 C-17's." The Program Director stated that DoD Regulation 5000.2-R, Section 3.3.1, "Sources," dated May 15, 1996, allowed consideration of commercial and nondevelopmental items as a primary source of supply. Public Law 103-355, "The Federal Acquisition Streamlining Act of 1994," required:

- preference for the acquisition of commercial items by Federal agencies,
- prime contractors and subcontractors to incorporate commercial nondevelopmental items as components, and
- modification to the maximum extent practicable to ensure that the requirements were met by commercial and nondevelopmental items.

The Program Director stated that the Air Traffic Navigation, Integration, and Coordination System was under development; that GCA-2000 radar met the system requirements document requirements and was a modified commercial off-the-shelf item that provided the earliest capability, October 1998 and recommended that, on receipt of congressional reprogramming, the Air Force should proceed with sole-source procurement under the authority of unusual and compelling urgency.

---

## Urgency Based Schedule

AMC issued the combat mission needs statement for Air Mobility Contingency Precision Approach on November 14, 1996, which stated: "... integral to AMC requirement is a rapidly deployable ASR/PAR system to support large scale 24-hour operations in an austere, adverse weather environment."

On March 12, 1997, the Commander, AMC, issued a statement of objectives for the GCA-2000 radar system that stated, "3.2 Schedule: It is the desire of AMC and the Air Force to accept the first article not later than 10 months from contract start. Delivery of units 2-4 will be delayed until completion of a 2 month, USAF/AMC defined test of the first article ..."

On June 2, 1997, the Assistant Secretary of the Air Force issued a Program Management Directive 2062(15)/35114F/35137F) for the Air Traffic Control and Landing System. The Program Management Directive for AMC Ground Controlled Approach (GCA) radar (Appendix K) listed the following milestone dates and significant events:

- Factory Acceptance Test (FAT): Complete 10 months after contract date
- OUE: Complete 12 months after contract date
- Initial Operational Capability (IOC): 12 months after contract award
- Full Operational Capability (FOC): 15 months after contract award

The contract was awarded to ITT Gilfillan on October 24, 1997, for three GCA-2000 radar systems, related data, spares, and training and technical manuals. Section B, Contract Line Item Number (CLIN) 0001AA, stated that the contractor shall deliver the first GCA-2000 10 months after contract award; CLIN 0002AA, stated that the second unit shall be delivered 1 month after the completion of the Government operational utility evaluation, and the third unit was to be delivered 1 month after unit two.

The system acceptance tests were conducted at the contractor facility from October 5 to 22, 1998; the first system was delivered 2 months late on October 28, 1998; an operational utility evaluation plan for the GCA-2000 radar was approved in November 1998; an accompanying test schedule listed EMI tests from November 11 to 13, 1998; environmental tests from November 14 to December 7, 1998; and flight tests from December 10 to 22, 1998.

---

## Airport Surveillance Radar Functionality

**Airport Surveillance Radar.** Approach control radar is used to detect and display an aircraft's position in the terminal area. ASR provides range and azimuth information but does not provide elevation data. ASR coverage can extend to 60 miles.

**Precision Approach Radar.** The PAR equipment is operated by the Federal Aviation Administration or by the Services to detect and display azimuth, elevation, and range of aircraft on the final approach course to a runway. The PAR equipment is primarily used to conduct a precision instrument approach where the controller issues guidance instructions to the pilot based on the aircraft's position in relation to the final approach course (azimuth), the glidepath (elevation), and the distance (range) from the touchdown point on the runway as displayed on the radar scope. In the GCA-2000 radar, the PAR range is up to 20 nautical miles in the clear sky with azimuth coverage of 30 degrees.

The acquisition strategy for a nondevelopmental item was justified because the GCA-2000 radar system was sold to Brazil; however, only the PAR portion of the system was sold commercially. The PAR azimuth antenna covers a 30-degree sector by electronic scan at a minimum rate of once each second. The ASR is an extension of the PAR azimuth function and both use the same azimuth antenna. The ASR azimuth function covers a 360-degree sector by a combination of mechanical rotation of the azimuth antenna and electronic scan. The entire 360 - degree azimuth coverage is scanned at a minimum rate of once each second. The ASR range is up to 30 nautical miles with an altitude up to 10,000 feet.

The Air Force purchased the GCA-2000 radar system with PAR and ASR functionalities, but the lack of demonstrated ASR functionality was not identified and a development effort was not included in the acquisition strategy. During the system operational testing, numerous failures were observed in the ASR and combined modes. These failures may have occurred because the ASR function was not fully developed.

In contrast to the ASR, the Air Force identified that the secondary surveillance radar, which is a back up radar for the ASR function, required development. On April 11, 1997, the Communications and Air Space Management System Program Office prepared a background paper on the GCA-2000 radar system that listed technical risks and modifications needed to support AMC requirements. The modifications included increased range, addition of secondary surveillance radar with a new antenna, a direct current motor, and a processor. The desired configuration would require 5 months to design.

---

## Testing

With the exception of the multiple target requirement addressed in finding A, the GCA-2000 radar system was thoroughly tested during the system acceptance test and operational utility evaluation. The tests included environmental testing and field operational testing.

**System Acceptance Tests.** The system acceptance tests were conducted by the contractor from October 5-23, 1998. The contractor validated 316 points in accordance with the system specifications by analysis, manufacture data sheets, inspections, demonstrations, and tests. All issues including testing were resolved before delivery of the first system on October 23, 1998. However, testing for the Federal Aviation Administration certification or air transportability were not performed before the GCA-2000 radar system was accepted.

The contractor satisfied the system specification requirements for PAR Target capacity by simulating the system acceptance tests using internally generated test targets inserted ahead of the plot extractor. Fifty test targets were verified as being extracted, tracked, and presented in the PAR azimuth display. Similarly, 22 targets were verified in the elevation display.

The operational utility evaluation testing of the GCA-2000 radar system was planned and conducted in two phases by the AMC 46th Test Squadron and 33rd Flight Test Squadron. Phase 1 focused on suitability issues such as initial assessment of training, human factors, and environmental and electromagnetic interference tests. Phase 2 evaluated the effectiveness and suitability of the GCA-2000 radar system and focused on operational field testing, assessment of training, interoperability, and other suitability issues.

**Environmental Testing.** The environmental testing included high and low temperatures, snow, ice, rain, sand, dust, set-ups, and inspections. The EMI tests and environmental tests were conducted in test chambers located at Eglin AFB.

Several deficiencies were noted during the environmental testing: the failure of the shelter air conditioner and sensor, the shelter generator surge, the sensor antenna brake failure, the failure to attain operational status within 2 hours as required, the reduction in speed of secondary surveillance radar antenna from 15 miles an hour to 5 miles a hour during the blowing sand test, SSR system failure during operational testing, and a cable failure from exposure to cold. Subsequent to the Phase 1 Environmental testing, 23 deficiency reports were prepared.

---

**Field Operational Testing.** Phase 2 of the operational utility evaluation field operational testing started on January 5, 1999, at Dover AFB, but stopped on January 13, 1999, when major technical problems were discovered. On January 20, 1999, the Inspector General, DoD, evaluation team visited Dover AFB, and the Test Manager provided a status briefing of the field operational testing. He said the test was suspended when the radar system failed to track large targets, and that the testing would resume after the contractor had fixed the large-target tracking and other problems. The Project Manager later informed the evaluation team that the problem of tracking large targets had been solved but additional serious software and hardware deficiencies, including target drop-off problem, had been discovered. The Project Manager informed the contractor that the system operational testing could not be completed until all the deficiencies were corrected. After the contractor fixed the problems, a 72-hour burn-in test was performed. At a test readiness review on April 22, 1999, the contractor and testers discussed the system status and decided to resume field operational testing on April 26, 1999. On May 10, 1999, the Project Manager informed the evaluation team that the ASR had again experienced target drop-off problems that could be attributed to software deficiencies and assured that the system would be fixed when it was flown to Van Nuys, California, in late May 1999. The Project Manager also stated that 80 approaches in ASR mode were observed and 20 approaches in the PAR mode were controlled, although not simultaneously and the contractor was correcting the deficiencies for the post-retrofit factory acceptance tests.

## **Conclusion**

The Air Force established an unusual and compelling urgency and purchased a sole-source nondevelopmental items system that would meet the system requirements and provide the earliest GCA-2000 radar capability. The Air Force identified the lack of demonstrated functionality of the secondary surveillance radar and included a development effort in the acquisition strategy. However, the lack of demonstrated ASR functionality was not identified and a development effort was not included in the acquisition strategy. During the field operational testing in January and again in April-May 1999, the radar repeatedly failed to perform in the ASR mode and was undergoing ASR developmental efforts to correct deficiencies. The critical initial operational capability date of October 1998 was not met.

---

## **Recommendation and Management Comments**

**We recommend, for future programs, that the Program Director, Global Air Traffic Operations Mobility Command and Control System Program Office include a developmental effort for nondevelopmental items when system functions are not commercially available.**

**Management Comments.** The Air Force concurred with the recommendation.

---

## Appendix A. Evaluation Process

### Scope

To accomplish the evaluation objective, we reviewed the adequacy of the test plan, environmental and operational test plans, and test procedures. We also reviewed the results of the system acceptance tests.

### Methodology

We conducted the evaluation from May 1998 through October 1999, in accordance with standards implemented by the Inspector General, DoD. We obtained and examined the minutes of three working group meetings, draft and final test plans, and the system acceptance test results performed by the contractor.

**Contacts During the Evaluation.** We visited or contacted individuals or organizations within and outside the DoD. Further details are available on request.

**Use of Computer-Processed Data.** We did not use computer-processed data to perform this evaluation.

#### **DoD-Wide Corporate-Level Performance and Results Act (GPRA)**

**Coverage.** In response to the Government Performance and Results Act, the Secretary of Defense annually establishes DoD-wide corporate-level goals, subordinate performance goals, and performance measures. This report pertains to achievement of the following goals and subordinate performance goals, subordinate performance goals, and performance measures:

- **Goal 1:** Shape the international environment and respond to the full spectrum of crises by providing appropriately sized, positioned, and mobile forces. **Performance Goal 1.3:** Maintain the capability to move military forces from the United States to any location in the world in response to aggression, using a combination of airlift, sealift, and prepositioned equipment. (00-DoD-1.3)
- **Goal 2:** Prepare now for an uncertain future by pursuing a focused modernization effort that maintains United States qualitative superiority in key warfighting capabilities. Transform the force by exploiting the Revolution in Military Affairs, and reengineer the Department to achieve a 21st century infrastructure. **Performance**

---

**Goal 2.4:** Meet combat forces' needs smarter and faster, with products and services that work better and cost less, by improving the efficiency of DoD acquisition processes. **(00-DoD-2.4)**

**General Accounting Office High-Risk Area.** The General Accounting Office has identified several high-risk areas in DoD. This provides coverage of the Defense Contract Management high-risk area.

**Management Control Program.** Review of the management control program was not within the scope of this evaluation.

## **Prior Coverage**

Inspector General, DoD, Report No. 98-070, "Short-Term Precision Landing Capabilities for C-17 Aircraft," February 11, 1998

Inspector General, DoD, Report No. 97-219, "Lessons Learned From Acquisitions of Modified Commercial Items and Nondevelopmental Items," September 23, 1997.

---

## **Appendix B. Report Distribution**

### **Office of the Secretary of Defense**

Under Secretary of Defense for Acquisition, Technology, and Logistics  
Deputy Under Secretary of Defense (Acquisition Reform)  
Under Secretary of Defense (Comptroller)  
    Deputy Chief Financial Officer  
    Deputy Comptroller (Program/Budget)  
Director, Defense Logistics Studies Information Exchange

### **Department of the Navy**

Naval Inspector General  
Auditor General, Department of the Navy

### **Department of the Air Force**

Assistant Secretary of the Air Force (Financial Management and Comptroller)  
Auditor General, Department of the Air Force

### **Non-Defense Federal Organizations**

Office of Management and Budget  
General Accounting Office  
    National Security and International Affairs Division  
    Technical Information Center

---

## **Congressional Committees and Subcommittees, Chairman and Ranking Minority Member**

Senate Committee on Appropriations

Senate Subcommittee on Defense, Committee on Appropriations

Senate Committee on Armed Services

Senate Committee on Governmental Affairs

House Committee on Appropriations

House Subcommittee on Defense, Committee on Appropriations

House Committee on Armed Services

House Committee on Government Reform

House Subcommittee on Government Management, Information, and Technology,

Committee on Government Reform

House Subcommittee on National Security, Veterans Affairs, and International

Relations, Committee on Government Reform

# Air Force Comments



DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS UNITED STATES AIR FORCE  
WASHINGTON, DC

19 MAY 2000

MEMORANDUM FOR Assistant Inspector General for Auditing  
Office of the Inspector General, Department of Defense

FROM: HQ USAF/XO  
1480 Air Force Pentagon  
Washington DC 20330-1480

SUBJECT: Ground Control Approach-2000 Radar System Test Plan and Test Results, (Project No. 8PT-0037) (DoD IG Draft Report, Same Subject, 9 Feb 00)

1. This is in reply to your memorandum requesting the Assistant Secretary of the Air Force (Financial Management and Comptroller) to provide the Air Force comments on subject report.
2. Our comments are as follows (for clarity, we are including the recommendations from the draft report, verbatim):
  - a. **Recommendation A.** "We recommend the Program Director, Global Air Traffic Operations Mobility Command and Control System Program Office, and the Commander, Air Mobility Command, prepare test plans to demonstrate the extent to which controllers can meet the multiple target requirement with the GCA-2000 radar system as shown in the requirements documents."

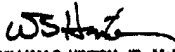
Partially Concur. The Air Force concurs with the recommendation to establish a test plan to further demonstrate the capability for air traffic controllers to simultaneously control 15 aircraft using the airport surveillance radar (ASR) while simultaneously controlling 2 aircraft using the precision approach radar. Air Mobility Command's 33d Flight Test Squadron will develop the test plan. However, the Air Force already deems the system suitable for its intended purpose--first-in, expeditionary air traffic control. Rigorous simulation demonstrated the ability of the system to simultaneously acquire and track 15 ASR targets and 2 PAR targets. Furthermore, an operational suitability evaluation, conducted by air traffic controllers using "live" traffic, confirmed the system's utility.

- b. **Recommendation B.** "We recommend for future programs, that the Program Director, Global Air Traffic Operations Mobility Command and Control System Program Office, include a developmental effort for nondevelopmental items when system functions are not commercially available."

Concur.

2

3. The XO point of contact for this issue is Major Chris Cotts, HQ USAF/XOOR,  
(703) 601-0214 (DSN 329), e-mail: [christopher.cotts@pentagon.af.mil](mailto:christopher.cotts@pentagon.af.mil).

  
WILLIAM S. HINTON, JR., Maj Gen, USAF  
Asst Deputy Chief of Staff  
Air & Space Operations

cc:  
HQ AMC/DO/XP/FM/TE  
HQ AFMC/IG  
SAF/FMPF/AQI  
HQ ESC/IG/GA

## **Evaluation Team Members**

The Audit Followup and Technical Support Directorate, Office of the Assistant Inspector General for Auditing, DoD, prepared this report.

David A. Brinkman  
Kenneth H. Stavenjord  
Chandra P. Sankhla  
Jamie A. Bobbio

## INTERNET DOCUMENT INFORMATION FORM

**A . Report Title:** Ground Control Approach-2000 Radar System Test Plan and Test Results

**B. DATE Report Downloaded From the Internet:** 07/21/00

**C. Report's Point of Contact: (Name, Organization, Address, Office Symbol, & Ph #):** OAIG-AUD (ATTN: AFTS Audit Suggestions)  
Inspector General, Department of Defense  
400 Army Navy Drive (Room 801)  
Arlington, VA 22202-2884

**D. Currently Applicable Classification Level:** Unclassified

**E. Distribution Statement A:** Approved for Public Release

**F. The foregoing information was compiled and provided by:**  
DTIC-OCA, Initials: \_\_VM\_\_ Preparation Date 07/21/00

The foregoing information should exactly correspond to the Title, Report Number, and the Date on the accompanying report document. If there are mismatches, or other questions, contact the above OCA Representative for resolution.